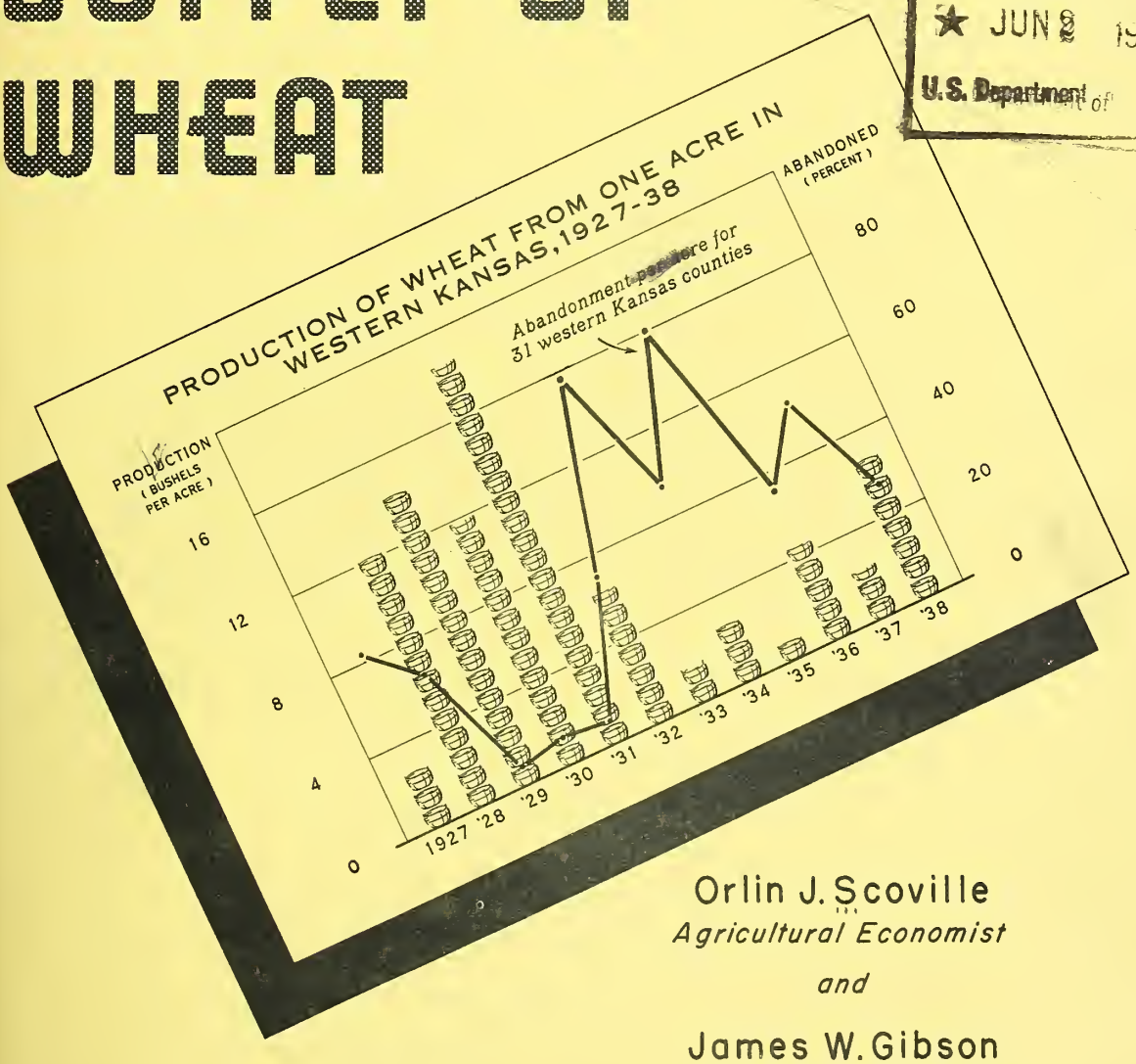
THE GREAT PLAINS AND THE SUPPLY OF WHEAT



Orlin J. Scoville
Agricultural Economist

and

James W. Gibson
Jr. Agricultural Economist

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL ECONOMICS

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By Orlin J. Scoville, Agricultural Economist,
and
James W. Gibson, Junior Agricultural Economist

CONTENTS

PRELIMINARY CONSIDERATIONS

For many years the Great Plains region has been given a pre-eminent place among the critical margins in the agriculture of the United States. The literature as far back as 1896, at least, gives ample evidence that the capacity of this region for stable crop production and stable settlement was under suspicion. This was true long before the recent years of drought began. Much has been written about the Dust Bowl and the hazards of farming in the Great Plains, but some aspects of the situation have not as yet received the attention they deserve. One of these relates to the part that the Great Plains region has in the problem of surplus wheat production.

1/ Valuable assistance was given the authors in the collection of data and in developing the study by T. S. Thorfinnson, Senior Agricultural Economist.

It is customary and, in general, correct to consider that the marginal areas of the country furnish little of the market supply of staple farm products. Tabulations from the 1930 census indicate that half the farms at the lower end of the income scale contribute only 11 percent of the value of farm products sold, or about the same proportion that comes from one-half of 1 percent of the farms at the top of the scale. 2/ These figures have been widely used to show that no conceivable retirement of submarginal farms could be expected to have much effect on the surplus problem.

But in the Great Plains there is a different situation. Here is an area extensively given over to the production of a staple cash crop -- wheat. It is adapted by topography and soils to mechanized farming, and is ill-adapted to subsistence farming. It is an area which at times has produced bountifully and at other times hardly at all. Marginality in this area is not due to a low level of productivity but to extreme fluctuations in productivity from year to year. It is this which distinguishes it from most of our marginal areas.

This report is concerned with two phases: (1) The volume of wheat production in the more hazardous portions of the Great Plains with respect to total United States wheat production, and (2) the variability from year to year in the supply that comes from this region compared with fluctuations in the United States crop as a whole. As a preface, something will be said concerning the physical environment of the Great Plains as it affects wheat growing and, in conclusion, suggestions will be made with respect to agricultural policy.

The Great Plains has no commonly accepted fixed boundary. In general, the mountains on the west, the 20-inch rainfall line on the east, the Canadian boundary on the north, and the southern edge of the high plains escarpment on the south, are taken to be the limits of the Great Plains. This region, without embracing any entire State, includes parts of 10; States commonly designated as the Great Plains States are: Montana, North Dakota, South Dakota, Wyoming, Nebraska, Colorado, Kansas, New Mexico, Oklahoma, and Texas.

For the purposes of this report an area termed the "high-risk area" has been delineated, indicating approximately the part of the Great Plains in which wheat growing is accompanied by the greatest climatic hazards (fig. 1). Irrigated areas insofar as practicable have been excluded. This area has been delineated primarily on the basis of the judgment of a number of agricultural workers in the Great Plains, supported by actuarial data from the Federal Crop Insurance Corporation. It should be regarded as a preliminary delineation, subject to later refinement. In particular, it should be pointed out that the degree of risk is by no means the same in all parts of this area. For convenience in the use of statistics, the area boundaries follow county lines. It will be noted that a boundary between the areas of spring-wheat and winter-wheat production has been drawn. This indicates only that one predominates over the other. A wide belt is found in which both are grown.

2/ Baker, O. E. A Graphic Summary of the Number, Size, and Type of Farm, and Value of Products. U.S. Dept. Agr. Misc. Pub. 266, p. 68, 1937.

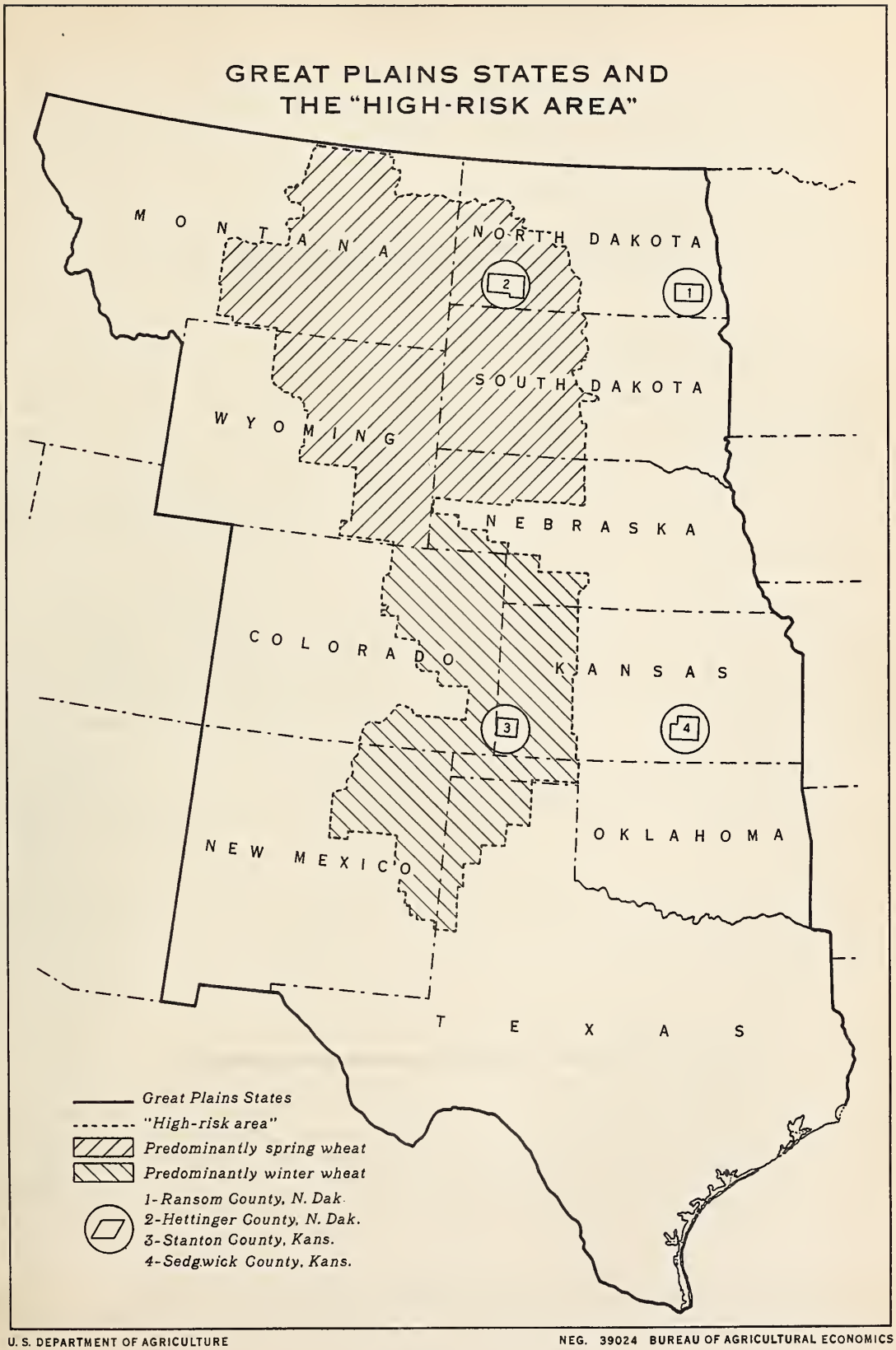
GREAT PLAINS STATES AND
THE "HIGH-RISK AREA"
MONTANA
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
NEBRASKA
COLORADO
KANSAS
OKLAHOMA
NEW MEXICO
TEXAS
1
2
3
4
Great Plains States
"High-risk area"
Predominantly spring wheat
Predominantly winter wheat
1-Ransom County, N. Dak.
2-Hettinger County, N. Dak.
3-Stanton County, Kans.
4-Sedgwick County, Kans.
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FIGURE 1

THE GREAT PLAINS ENVIRONMENT AND THE GROWING OF WHEAT

Climate and Wheat Production

"The ideal climate for wheat," according to one authority, "is one with a long and rather wet winter, prolonged into a cool and rather moist spring, which gradually merges into a warmer summer, the weather growing progressively drier as it grows warmer, with only comparatively light rains after the blossoming of the crop,-- just enough to bring the grain to maturity. Wheat should have abundant sunshine and rather dry air, but without dry and scorching winds toward harvest, until the grain is fully ripe, and then warm, dry, rainless weather until the harvest is gathered." 3/

A careful comparison of these requirements with the climatic characteristics of the Great Plains indicates that the "normal" climatic conditions derived from averages of growing season, distribution of sunshine and temperature, monthly distribution of rainfall, and in much of the area, the average annual amount of precipitation, are not particularly unfavorable for wheat production. In general, the spring is moist, the summer not so wet as to interfere with the maturity of the crop, and a considerable amount of moisture falls on the ground during the fall and winter, to be stored there for the next crop.

Nature has made another and unique provision for this area: We read that "in the Central Great Plains States . . . it is interesting to note that whereas rainfall is usually heavy from June to August, as compared with other seasons of the year, it mostly occurs in the form of night showers, which offer a minimum interference with the gathering of the wheat crop." 4/

Growing conditions in any one year, however, seldom correspond to the average climatic characteristics, and it is in regard to the extreme variability of climatic conditions from one year to another, rather than their normal values, that many areas in the Great Plains fail to furnish an attractive climatic environment for wheat production. This variability is not limited to rainfall alone; wide fluctuations occur in temperature and wind velocity which alter the rates of evaporation and therefore affect the efficiency of the precipitation. Moreover, it should be kept in mind that long series of dry years may occur, interspersed with occasional wet periods. The following quotation illustrates the variability of precipitation as shown by the 67-year rainfall record at Hays, Kansas: "The highest 5-year average was 30.64 inches (of rainfall) and the lowest was 17.87 inches . . . The driest of the 5-year periods received only 58 percent as much rain as the more humid years. Of the seven times since 1868 when the annual precipitation exceeded 30 inches, three were between 1875 and 1878. Only twice since 1903 has more than 30 inches of rain fallen in a single year. In 1894, the driest year, the rainfall was only 11.80 inches, whereas in 1874, the rainiest year, it amounted to 35.40 inches, exactly three times

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3/ Henry, A. J., and others. Weather and Agriculture. U.S. Dept. Agr. Yearbook, p. 511, 1924.
4/ Ibid, p. 515.

as much." 5/ This author states further that it appears that in the Great Plains, the 40-year period from 1825 to 1865 "was a long drought with only occasional wet years."

Some idea of the hazards involved in farming in the Great Plains can be gathered from table 1. In addition to the years in which crops actually failed, crops were poor, or only fair in many others.

Table 1.- Frequency of occurrence of wheat fields which were good, medium, poor, and failures in various counties in the Great Plains 1/

County and State	Percentage of years yield was			
	Good	Medium	Poor	Failure
	Percent	Percent	Percent	Percent
Hettinger Co., N.Dak.	17	44	25	14
Perkins Co., Nebr., loam area	23	36	21	20
Perkins Co., Nebr., sandy loam area	20	40	19	21
Goshen Co., Wyo., nonirrigated	18	42	20	20
Cheyenne Co., Colo.	14	25	15	46
Dallam Co., Tex., row-crop area	11	8	4	77
Dallam Co., Tex., grain area	20	20	16	44
Curry Co., N.Mex., row-crop area	15	19	29	37
Curry Co., N.Mex., grain area	19	21	27	33

1/ Compiled from Kifer, R. S., and Stewart, H. L. Farming Hazards in the Great Plains. W.P.A. Research Monograph XVI, 1938. Supplementary Tables, Appendix A.

For none of the counties listed in this table were wheat yields reported to be good as often as one year in four. For three counties out of the six, it was reported that failures occurred one year in three or oftener.

Not all crop failures are due to drought. Even in an arid country, crops are occasionally hurt by an excess of moisture. In addition, hail, insect damage, soil blowing, frost, rust, and smut are principal sources of damage. Frequently, more than one of these occur in the same year, as is sometimes the case with drought and soil blowing, or excessive moisture and rust. Table 2 indicates the relative importance of each of these types of damage.

5/ Goodrich, Carter, and others. Migration and Economic Opportunity. The University of Pennsylvania Press, Philadelphia, p. 219, 1936.

Table 2.- Relative importance of various types of damage to wheat 1/

County and State	Percentage of years serious or total damage was reported, by types of damage						
	Drought	Insects	Hail	Soil blowing	Smut and rust	Frost	Excess precipitation
	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Hettinger Co., N.Dak.	25	9	9	2	2	1	-
Perkins Co., Nebr., loam area	29	3	9	9	4	4	2
Perkins Co., sandy loam area	23	6	9	7	4	5	-
Goshen Co., Wyo., dry land area	20	3	8	10	3	3	1
Cheyenne Co., Colo.	38	5	9	5	2	1	2
Dallam Co., Tex., row crop area	30	-	3	3	-	3	-
Dallam Co., Tex., wheat area	19	1	4	6	1	-	4
Curry Co., N.Mex., row crop area	30	1	6	3	-	1	3
Curry Co., N.Mex., wheat area	28	-	6	3	-	-	-

1/ Kifer and Stewart. Farming Hazards in the Great Plains. Supplemental tables.

Evidently drought is by far the most important cause of damage, but hail, soil blowing, and insects are frequent sources of crop loss.

Factors Other Than Climate of Importance in Wheat Production

Other factors than climate are important in wheat production. Soils should be fertile and land surface such as to permit the use of large-scale machinery. In both of these respects, the Great Plains region is well situated. Soils are predominantly of the Dark Brown, Brown, and Southern Chernozem groups, typical of soils developed under semiarid conditions. They have been subject to only a small degree of leaching and, on the whole, are fertile. The topography is generally level to undulating, allowing the fullest development of large-scale farming. It was on these plains that the famous Hickman Price farms flourished for a time, with repairmen traveling on motorcycles from combine to combine, during the harvest season.

The small amount of labor necessary to take care of an acre of wheat in the Great Plains is indicated by table 3, which gives the estimated hours of man labor required in growing one acre of winter wheat in different regions. Only the Pacific Northwest can show comparable performance, and this adaptability to large-scale machine operation induces wheat growers to meet the risk of Great Plains farming.

Table 3.- Labor used per acre in producing winter wheat, 1936 1/

Western Hard Winter Wheat Area 2/	2.2 hours
Eastern Hard Winter Wheat Area 3/	3.6 hours
Northwestern Winter Wheat Area 4/	3.4 hours
Corn Area 5/	8.8 hours
Greene County, Ga.	22.8 hours
Lancaster County, Pa.	18.4 hours
Darlington County, S. C.	15.2 hours

1/ From W.P.A. National Research Project, Bulletin A-10, Changes in Technology and Labor Requirements in Crop Production: Wheat and Oats. These estimates are adjusted to include labor used in summer fallowing, and labor used on abandoned acreage.
2/ Southwestern Nebraska, western Kansas, Texas and Oklahoma Panhandles, northwestern Colorado, eastern New Mexico.
3/ Southeastern Nebraska, central and eastern Kansas, central Oklahoma.
4/ Northern Idaho, southeastern Washington, northern Oregon.
5/ Ohio, Indiana, west central Illinois.

CONTRIBUTION OF THE GREAT PLAINS TO THE UNITED STATES WHEAT CROP

Wheat Growing Has Expanded in the Great Plains

Much of the expansion in world wheat production which has occurred in the last few decades can be associated with the extension of cultivation into the vast grasslands of the Americas, Australia, and Soviet Russia. 6/ In the United States, the introduction of wheat farming into the Great Plains has been a part of this process.

Under the influence of technical advances in farming methods and transportation, development of adapted crop varieties, the building of railroads, the increase in population, and the stimulus of the World War, the settlement of the Great Plains has moved rapidly ahead during the past half century.

In 1899, 17.8 million acres of wheat were harvested in the Great Plains States, compared with 39.0 million in 1919, and 46.5 million in 1938. In this record, the most rapid expansion occurred within the high-risk area, in which the acreage of wheat harvested increased from 0.8 million acres in 1899 to 6.3 million in 1919; and to 12.2 million acres in 1929. It then receded to 9.7 million acres in 1938. In 1929, the Great Plains States contained 70 percent, and the high-risk area 20 percent, of the United States wheat acreage harvested, and contributed 62 percent and 18 percent respectively of the total production. During 13 of the 20 years 1919-38, inclusive, the Great Plains States produced more than half the

6/ Strong, H. M. Export Wheat Producing Regions, Economic Geography, Vol. VIII, No. 2, p. 161, April 1932. Also Zimmerman, E. W. World Resources and Industries. Harper and Bros., New York, p. 239, 1933.

United States wheat crop, and never produced less than 42 percent in any one year. The high-risk area during the same period has produced from 18 percent of the United States crop in 1929 to 6 percent in each of the years 1934, 1936, and 1937. There have been 13 years in which it has produced 10 percent or more of the crop.

From figure 2, four significant facts are readily apparent: (1) The share of the United States wheat acreage grown in the Great Plains States and the high-risk area has increased rather consistently during the period shown; (2) acreage harvested fluctuates markedly from year to year in these two areas; (3) the rate of increase in wheat acreage has been greater in the high-risk area than in the Great Plains States as a whole; and (4) much of the expansion in wheat acreage in the high-risk area of the Great Plains occurred in the decade following the World War rather than during the war. In particular, it should be noted that between 1919 and 1930, the acreage of wheat harvested in the high-risk area doubled.

Part of this increase may be due to differences in the percentage of the planted acreage that was harvested, but a large share of it must represent an increase in the acreage planted. In western Kansas, where a long-time record of the acres planted to wheat is found, this is known to be so (fig. 3).

Variability of Production in the Great Plains

An idea of the normal level of wheat production in the Great Plains is furnished by the foregoing discussion. However, wheat acreage and wheat yields fluctuate widely in this area, and something should be said about the variability of production in this region in its relation to the total wheat crop. If wheat growing were curtailed in the Great Plains, and particularly in that part of it where farming hazards are greatest, would a more stable and dependable annual supply of wheat in the United States result?

It was pointed out, in conjunction with figure 2, that the acreage of wheat harvested in the Great Plains fluctuates greatly from year to year. In fact, the pattern set by the Great Plains States appears to govern to a large extent the variations in acreage for the whole country. In part, the annual fluctuation is due to differences in the acreage planted to wheat, but it is probable that the influence of abandonment in poor-crop years is a larger factor. Data concerning seeded acreage are not available for the entire Great Plains, but the record of 31 western Kansas counties can be taken to illustrate the wide disparity between planted and harvested acreage (fig. 3). The wide fluctuations in acres harvested and the relatively minor variations in planted acreage from the long-time upward trend are evident.

The record of wheat planting and wheat production in the western counties of Kansas for the last 28 years is a chronicle of the ups and downs of wheat farming in the whole Southern Great Plains. During that period the acreage seeded to wheat has shown a rather steady increase, with only occasional recessions, but the acreage harvested has fluctuated widely. In only 2 years is it reported that the entire seeded acreage was harvested. For

FIGURE 2 - TRENDS IN ACREAGE OF WHEAT HARVESTED, 1899-1938

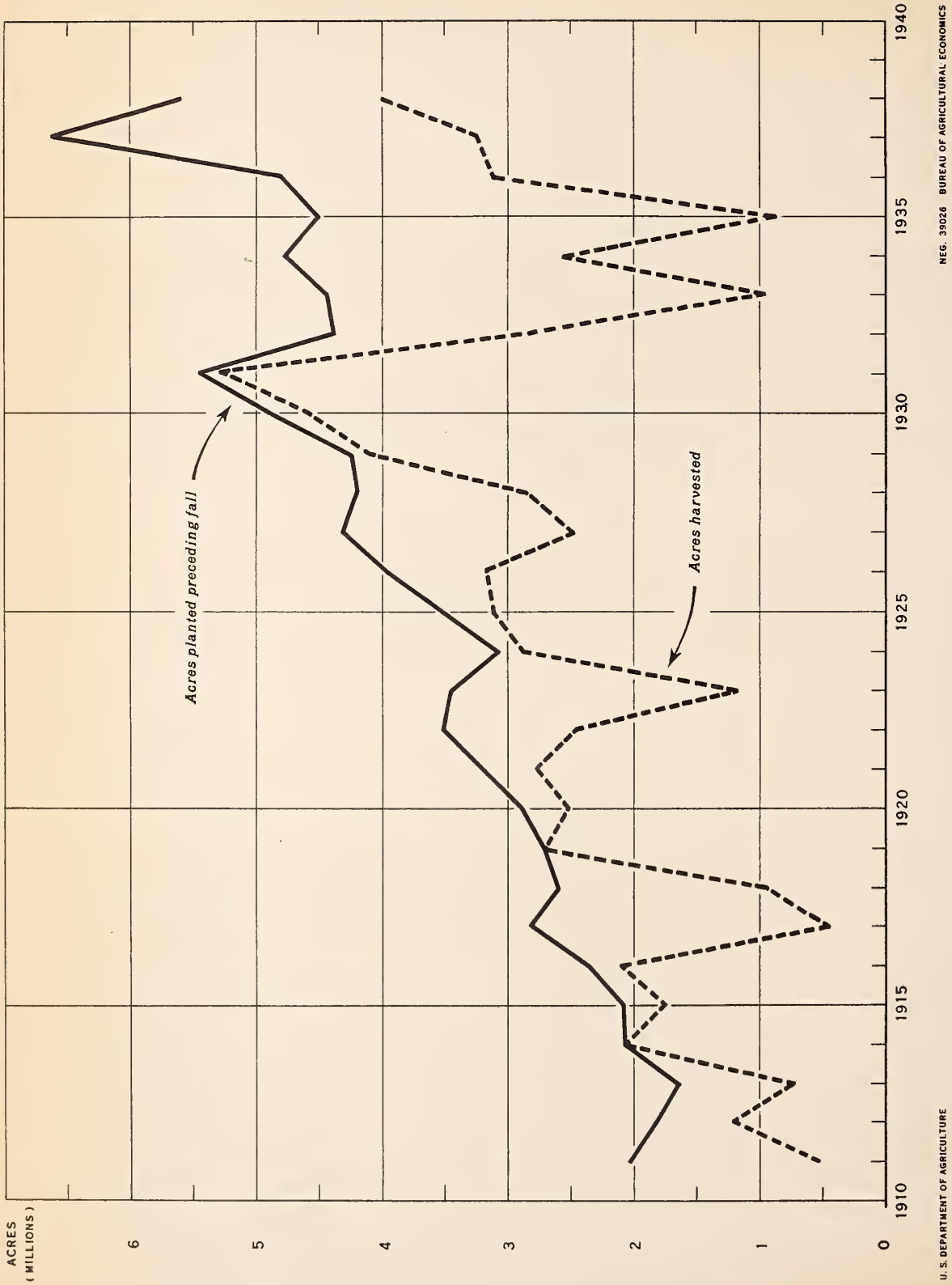

FIGURE 3 - ACRES OF WHEAT PLANTED AND ACRES HARVESTED IN 31 WESTERN KANSAS COUNTIES, 1911-38

about one year out of three, less than half the seeded acreage has been harvested. On a planted-acre basis, yields have been as low as three-quarters of a bushel, and as high as 17½ bushels. In 4 consecutive years yields were higher than 12 bushels, and in 5 years in a row they did not exceed 4½ bushels. In these 28 years, however, the acreage planted to wheat has grown from 2 million to about 6 million acres in the 31 counties of western Kansas.

Production is influenced by the yield per acre as well as by the acreage harvested. The 20-year average yield (1919-38) for the high-risk area was 10.7 bushels per harvested acre. The yield for all other wheat areas in the United States was 14.1 bushels. Thus, yields in the high-risk area were only about one-fourth lower than for the rest of the country. But in one year the high-risk area had a higher yield than the rest of the country, and in several years it was less than half as much. Figure 4 shows the annual yields for the high-risk area and for all other areas for the 20-year period. It will be noted that these yields are plotted on a semi-logarithmic scale, which permits comparison of the proportionate change in yields from year to year for the two series. The relative instability of wheat yields in the high-risk area is readily apparent.

A comparison of wheat production statistics between selected counties inside the high-risk area and counties outside the area will indicate the reasons for marking off this area for special attention. For this purpose, one pair of counties was selected in the spring-wheat area, and one pair in the winter-wheat area (fig. 1). The 13-year record of yields and abandonment in these counties is summarized in table 4.

Table 4.- A comparison of wheat fields and abandonment in eastern and western North Dakota, and eastern and western Kansas, 1926-38 average

Area	Average yield per harvested acre		Average yield per planted acre		Percentage planted acres abandoned
	Bushels	Coefficient of variation	Bushels	Coefficient of variation	
Spring Wheat Area 1/					
Hettinger County (Western N. Dak.)	8.0	66.7	6.0	81.0	25
Ransom County (Eastern N. Dak.)	9.0	42.0	7.3	58.0	19
Winter Wheat Area 2/					
Stanton County (Western Kansas)	12.3	67.4	7.3	101.0	55
Sedgwick County (Eastern Kansas)	14.5	33.1	14.0	36.0	3

1/ Includes yields for all wheat grown in these counties.
2/ Yields for winter wheat only; very little spring wheat grown.

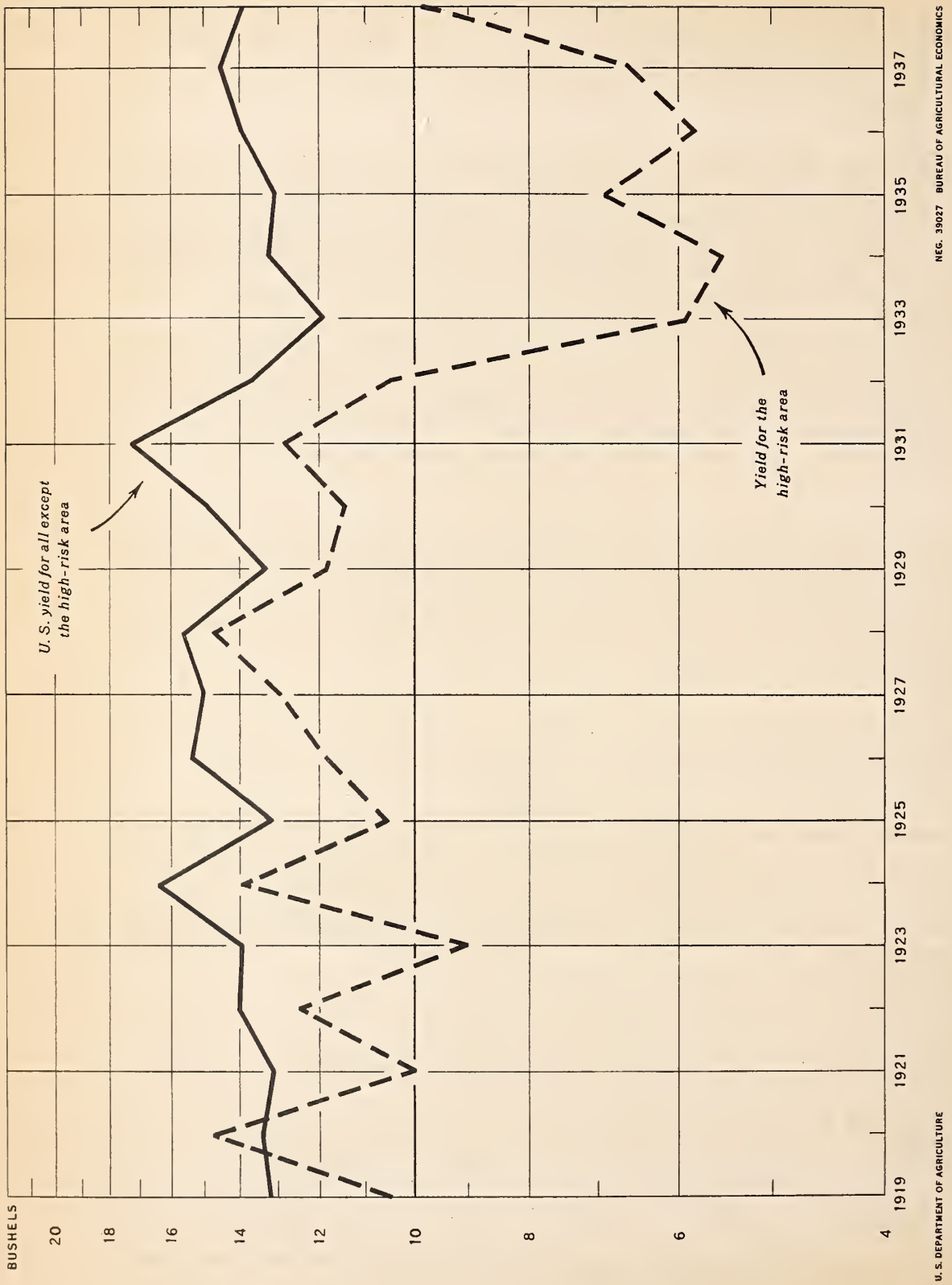

FIGURE 4 - WHEAT YIELDS PER HARVESTED ACRE FOR THE HIGH-RISK AREA AND FOR ALL OTHER U. S. WHEAT AREAS, 1919-38

Average yields per harvested acre for the two spring-wheat counties are about the same, and likewise for the two winter-wheat counties. Yields per planted acre differ slightly more in the two spring-wheat counties, and a very marked difference is found between yields of the winter-wheat counties. This is due to the greater importance of acreage abandonment in the winter-wheat area.

For the purposes of crop insurance, or the extension of credit, or for the usual kinds of farm planning that farmers must do, the stability of average yields, prices, or expenses is fully as important as their "average" or "normal" levels. It is as important that yields be dependable as that they should be high. Therefore, in table 4, the dependability of the averages has been measured and it appears that the variations in wheat yields per planted acre are about three times as great in western as in eastern Kansas, one-third greater in western North Dakota than in eastern North Dakota, 25 percent greater in western Kansas than in western North Dakota, and almost twice as great in eastern North Dakota as in eastern Kansas.

Influence of Production in the High-Risk Area Upon the United States Wheat Crop

Thus far the discussion has indicated that an appreciable part of the United States wheat supply comes from the high-risk area within the Great Plains. It has been emphasized that this share is subject to great variations from year to year. The question now arises as to the influence which wheat production in the high-risk area has had upon United States wheat crops in the past. Have bumper crops in the area coincided with large United States wheat crops with any degree of regularity? If so, has the crop in the high-risk area been large enough to add materially to the wheat surplus?

Indices of wheat production in the United States, the high-risk area, and all other areas, have been plotted on figure 5 for the period 1919-38, inclusive. The base for each index is the respective average yearly production for the same period. Therefore, the percent which the crop in any year is above or below this long-time average can be read directly from the chart. The wide fluctuations of production in the high-risk area are evident. Also it will be noted that in 10 of the 13 years when United States production was above the average, production in the high-risk area was also above average, and that of the 7 years in which United States production was below average, all but 1 were years in which high-risk area production was also below average. With few exceptions, heavy production in the United States has been accompanied by large crops in the high-risk area, and small crops in the high-risk area have come in the years of low production elsewhere. The high-risk area has produced wheat when it was least needed. This is illustrated in terms of bushels in figure 6.

Year-to-year fluctuation in the United States wheat crop cannot be attributed entirely to the erratic pattern of production in the high-risk area, although production in this area has made the variations larger than they otherwise would have been. For example, it can be seen from figure 5

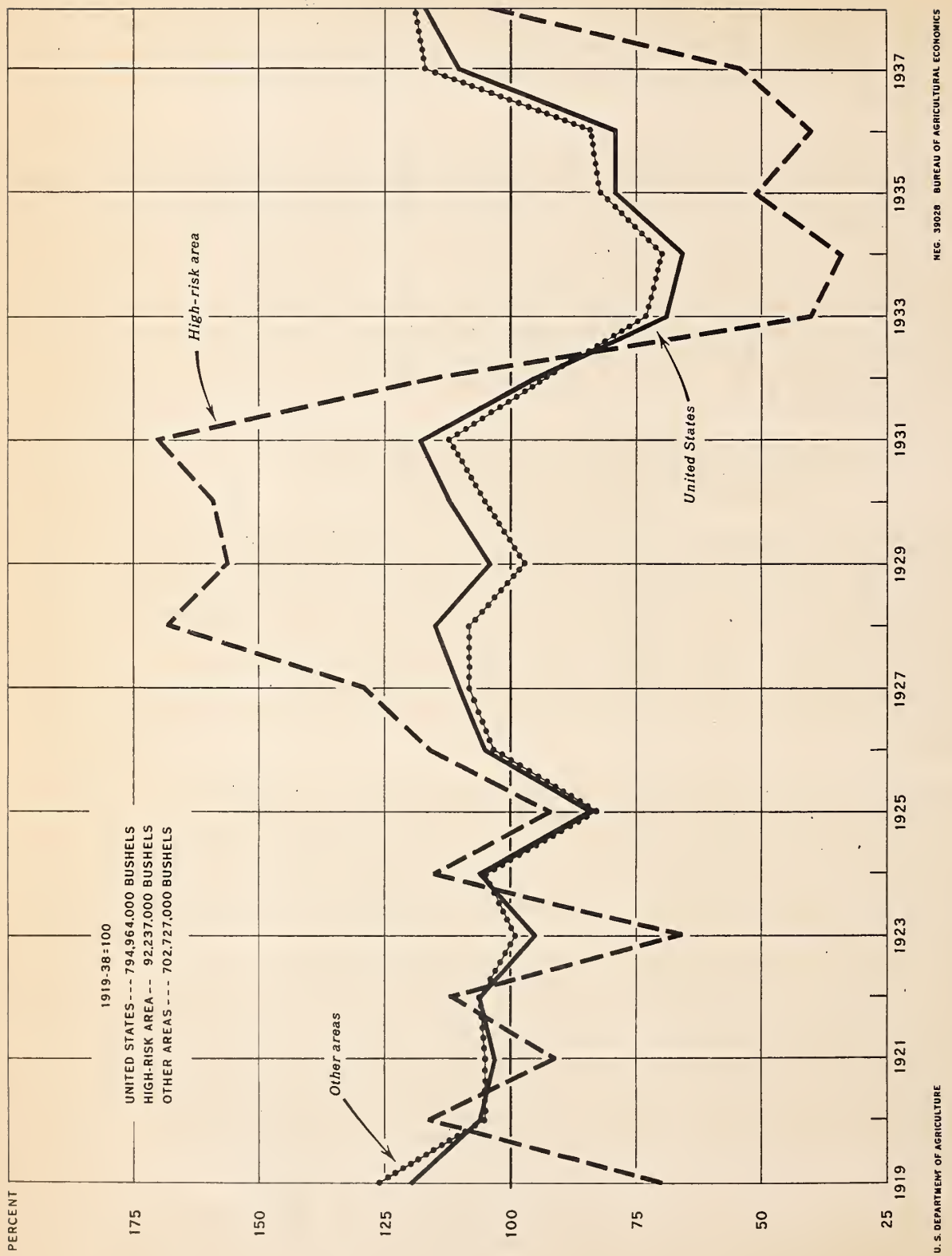

FIGURE 5 - INDICES OF WHEAT PRODUCTION, UNITED STATES, HIGH-RISK AREA, AND OTHER AREAS, 1919-38

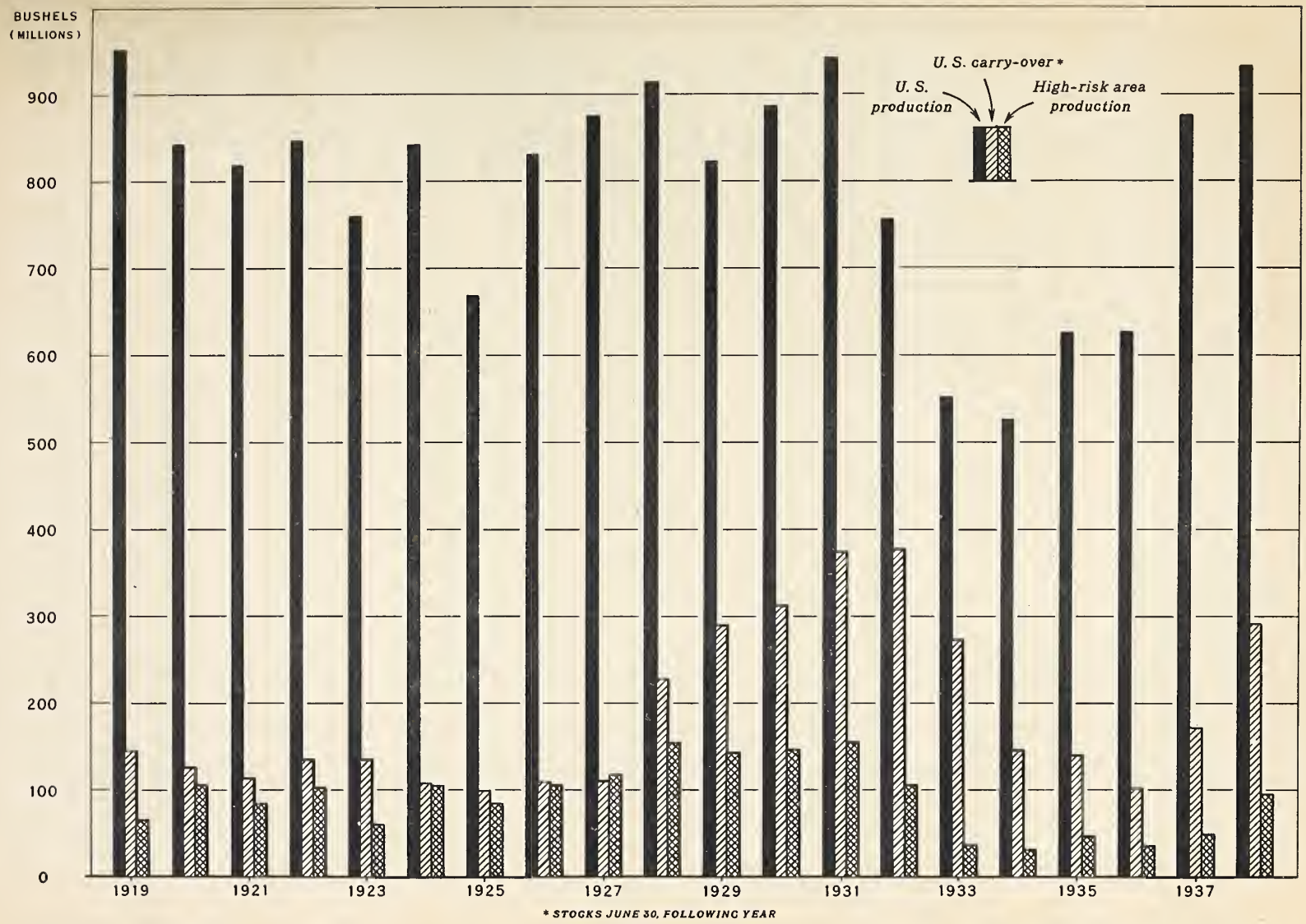

FIGURE 6 - U. S. WHEAT PRODUCTION AND CARRY-OVER, AND WHEAT PRODUCTION IN THE HIGH-RISK AREA OF THE GREAT PLAINS STATES, 1919-38

that the United States crop for 1928 was 15 percent above average. The crop in the high-risk area was 68 percent above average, and the crop in all other areas 8 percent above average. Likewise in 1931 the United States crop was 18 percent above the average, 70 percent above in the high-risk area, and for all other areas, 12 percent above average. Production in the high-risk area has likewise influenced the size of the small United States crops. In 1934 the crop in the high-risk area was 66 percent below the average, the United States crop was 34 percent below, and the crop in all other areas 30 percent below.

In addition to the influence which the high-risk area has had upon United States wheat production in individual years, this effect, to some extent, has been cumulative. In 7 consecutive years, from 1926 to 1932, high-risk area production was above average, and within this period, in 4 consecutive years it was 50 percent or more above the average. During the 5 years, 1933-37, high-risk area production was below average by from 46 to 66 percent.

These years of heavy production in the high-risk area occurred during the period in which a large surplus was being built up in the United States. Whereas this surplus was caused by large crops throughout the country and by a dwindling export market, the heavy production in the high-risk area in these years added to the distress of wheat growers everywhere. There is no reason to believe that the years of abundant harvest in the high-risk area from 1926 to 1932 will not be repeated. Also it is likely, in the light of experience, that they will be accompanied by heavy production elsewhere. If this is the case, and if the export market does not improve, wheat producers may find themselves confronted with a carry-over comparable to, or perhaps larger than, the surplus in the years 1929-34. Since 1919 seven wheat crops of more than 850 million bushels have been harvested; of these, the 1937 crop was the first since 1919 that was not accompanied by better than average production in the high-risk area. The 932-million-bushel crop of 1938 was accompanied by only about average production in the high-risk area. The crops of 1937 and 1938 were large because of heavy production in areas outside the high-risk area. An abnormally large crop in this area during these 2 years would have added materially to the surplus problem.

Types of Wheat Grown in the High-Risk Area

This discussion of the place of the high-risk area in United States wheat production should not be concluded without a word about the types of wheat grown in this region.

Five distinct and important classes of wheat are grown in the United States -- hard red winter, soft red winter, hard red spring, white, and durum -- listed in order of their importance with respect to the total wheat crop. These classes represent differences in milling and baking characteristics that to some extent vary with the climatic conditions where the wheat is grown. The hard wheats produce so-called "strong" flour that is especially adapted for making light (yeast-leavened) bread. The soft wheats, which are lower in protein and possess a soft, gluten character, are considered especially desirable for making pastries. Durum wheat is used

extensively in making the class of products known as alimentary pastes, which includes macaroni and spaghetti. 7/ Although considerable substitution of one class of wheat for another is made, the entire wheat crop should not be considered as a homogeneous commodity. In the Great Plains, the two principal classes of wheat grown are hard red spring and hard red winter, with a considerable acreage of durum wheat. In a rough way, it can be said that the five Northern Great Plains States produce hard red spring and durum wheats, while the production of hard red winter wheats predominates in the five Southern Plains States.

GREAT PLAINS WHEAT AND THE NATIONAL POLICY

On the basis of the facts presented in this report, it would seem that any national program for adjustment of wheat production should pay especial attention to the Great Plains, and to the areas of high-risk production in particular. This would be of most importance in connection with plans for restricting the production of wheat. Assuming, for the moment, that a reduction in the production of wheat is desirable because of the disappearance of foreign markets, a few of the advantages to be gained from making a substantial part of this reduction within the high-risk area may be itemized:

(1) Much of the area must be classed as marginal for wheat production because of recurrent periods of drought; evidence of marginality is available in the form of high relief loads, heavy mortgage and tax delinquencies, and extensive abandonment and physical deterioration of land. A reduction in the acreage devoted to wheat in favor of more diversified farming, including more grass, is already recognized as essential to the rehabilitation of the area. Therefore, a concerted effort to curtail wheat growing in this area would implement the present rehabilitation and conservation activities.

(2) This area contains the only large acreage of marginal wheat land in the United States which produces an appreciable quantity of wheat.

(3) In few, if any, places in the United States would a comparable reduction in wheat acreage adversely affect so few farmers and farm laborers. It should be possible to reduce to a considerable extent the wheat acreage in the high-risk area without causing any great disturbance in population or in the social institutions. From 1930 to 1940 the population decreased in 118 of the 153 counties of the high-risk area. This decrease ranged from practically none to more than 4,000 in some counties, and was very often more than 1,000 persons. That a large part of the decrease was in farm population is substantiated by the statement, "One of every four farm houses is abandoned in 53 counties of the Southern

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7/ Robbins. Botany of Crop Plants. Blakiston, Ed. 3, pp. 109-111, Philadelphia, 1931. Also Regional Problems in Agricultural Adjustment. U.S. Dept. Agr., A.A.A., Ch. 7, 1935.

Great Plains. Most of the abandonment has taken place in recent years." 8/

When considering the effect on population, probably no more opportune time than the present could be found for making adjustments in land use and type of farming in the high-risk area. The history of population movements in the Great Plains reveals that the area has been one of continual shifting of population, with much migration into and out of the area. Periods of immigration and emigration have tended to follow precipitation cycles. With the return of more favorable years for crop production, it is reasonable to expect a new wave of immigration into the high-risk area.

A reduction in wheat acreage with the return of such acres to grazing uses and adjustment of farming to a combination of wheat farming and livestock ranching in some cases would necessitate an increase in the size of the farm unit. Numerous small wheat farms are to be found in the parts of the high-risk area where adjustments are most needed. Incorporation of these smaller farms into larger units should have a long-time stabilizing effect on the population and should discourage farm immigration into the area.

At the present time some changes in the economy of the area, which are under way or in prospect, if properly directed would enable some farmers to turn from wheat growing to other activities. New developments in soil and moisture conservation widen the possibilities for diversified farming; the use of the underground water resources is increasing in parts of the area, and it is likely that in the vicinity of some of the larger towns the impetus of the defense program will bring opportunities for nonfarm employment, and the development of new farm enterprises, such as dairying and market gardening.

(4) The annual United States supply of wheat would be made more stable and more dependable. Large variations in yields per seeded acre mean that a larger carry-over is necessary. It is estimated that under present world conditions a 260 million bushel carry-over on July 1 would be needed in order to protect ourselves against any one year of unusually low yields. 9/ This is considerably larger than has been deemed necessary in the past.

This increase in the size of the carry-over considered necessary has no doubt been influenced by violent fluctuations in yields during recent years and by the knowledge that as we consume a greater portion of our crop domestically, it is necessary that we maintain adequate reserves for self-sufficiency and price stability. If by making the wheat supply more dependable the necessary carry-over could be reduced, a saving in the cost of storage could be effected.

8/ Land Use Survey of the Southern Great Plains. Mimeographed. Revised April 1, 1938, Division of Land Economics, Bureau of Agricultural Economics, p. 13. Most of the counties in the southern part of the high-risk area were included in this survey.

9/ Post, R. E. The Wheat Situation. Processed, p. 15, July 1940.

(5) If less wheat were grown in the high-risk area, there might be less short-time fluctuation in wheat prices. "Crop scares" appear to be one of the most important causes of short-time speculative fluctuations of wheat prices. Usually the advance in price is out of proportion to the degree of damage. To the extent that wheat production could be stabilized, this erratic behavior of the speculative markets would be eliminated. 10/

Against these advantages must be set the practical difficulty of taking large acreages of wheat out of production in an area in which the next alternative use for the land appears to be much less attractive. It must be admitted that for a large part of the high-risk area this is the case, particularly if it is necessary to put the land back into grass, which is a slow and difficult process. Furthermore, if wheat production is curtailed, part of the reduction should be made in those classes of wheat not produced in the Great Plains. During the last 20 years there were 3 years, 1934, 1935, and 1936, in which United States wheat imports exceeded exports. During these 3 years the United States exported practically no hard red spring wheat or durum wheat, a yearly average of 234,000 bushels of hard red winter, 32,000 bushels of soft red winter, and 1,900,000 bushels of white wheat.

It should also be realized that if a relatively larger reduction of wheat acreage is to be made in the high-risk area this reduction should not be applied as a "blanket program." Within that area, as designated in this report, are some small subareas well suited for permanent wheat production. At the other extreme are subareas that are so hazardous that no sizes and types of arable farms can be devised that offer possibilities of maintaining farm families on a permanent self-supporting basis. A shift to grazing uses of such land should be facilitated as rapidly as possible by land-purchase programs and other adjustment devices.

Between these two extreme situations are other subareas where a combination of wheat farming and livestock ranching gives promise of supporting farm families on a permanent basis. This would mean in most cases a reduction in the acreage planted to wheat. If such adjustments are to be made, they will need to be given positive direction by assistance to farmers in obtaining control of enough land to establish such farm units, by aiding in the restoration to grass cover of abandoned cropland, and by assistance in the development and carrying of adequate feed reserves.

Those considerations serve to point out that a limit to the degree of curtailment in wheat growing could and should be made in the high-risk area. Obviously all the needed adjustments cannot be made in that area alone. It seems reasonable, however, that insofar as it becomes necessary to limit the production of the hard wheats, winter and spring, an attempt should be made at regional adjustment, with first attention given to the high-risk area of the Great Plains.

10/ Irwin, H. S. Technical Conditions are Important Factors in Short-time Movements of Wheat Prices. Journal of Farm Economics, p. 736 ff. Nov. 1936.

NOTE CONCERNING DATA USED IN THIS REPORT

(1) County figures concerning wheat production were not available in Wyoming and New Mexico for all years. Therefore, in compiling figures for the high-risk area, it was necessary to use totals for these States. This should have little effect on the results, as counties considered as high-risk counties in New Mexico produced 91 percent of the State wheat production in 1929 and 66 percent in 1934, and counties considered as high-risk wheat counties in Wyoming produced 92 percent of that State's production in 1929 and 78 percent in 1934.

(2) Owing to lack of data, a straight-line interpolation for wheat acreage and production was made for all the high-risk counties in Texas for the years 1920-23, and 1925-27, and in Oklahoma for 1920-23. Wheat acreage and production for Arapahoe County, Colorado, were estimated in the same way for the years 1920-23 and for 1925.

(3) Wheat acreage and production were available only by totals of crop-reporting districts in South Dakota for the years 1920-22, inclusive; therefore, three counties not considered high-risk counties are included in the high-risk area total for these years.

(4) Harvested acreage was not available in Montana for the years 1935 and 1936, so planted acreage was used.

SUPPLEMENTARY TABLES

Table 5.- Wheat seeded and harvested for 31 western Kansas counties, crop years, 1911-38

Year	Acreage				Production	Av. yield per	
	Seeded	Harvested	Abandoned			Seeded acre	Harv. acre
	Acres	Acres	Acres	Percent	Bushels	Bu.	Bu.
1911	2,032,446	514,643	1,517,803	74.7	2,175,223	1.1	4.3
1912	1,830,076	1,213,010	617,066	33.7	11,610,036	6.3	9.6
1913	1,659,334	732,810	926,524	55.8	3,785,423	2.3	5.2
1914	2,065,870	2,065,870	-	-	35,315,882	17.1	17.1
1915	2,085,404	1,756,760	328,644	15.8	23,895,998	11.5	13.6
1916	2,359,262	2,096,123	263,139	11.2	29,283,337	12.4	14.0
1917	2,817,736	443,515	2,374,221	84.3	2,043,063	.7	4.6
1918	2,597,603	984,188	1,613,415	62.1	5,861,856	2.3	6.0
1919	2,699,502	2,699,502	-	-	30,834,768	11.4	11.4
1920	2,893,315	2,516,071	377,244	13.0	40,062,863	13.9	15.9
1921	3,196,521	2,781,519	415,002	13.0	27,250,635	8.5	9.8
1922	3,510,546	2,469,887	1,040,659	29.6	25,134,503	7.2	10.2
1923	3,447,126	1,179,741	2,267,385	65.7	6,784,744	2.0	5.8
1924	3,078,269	2,876,044	202,225	6.6	44,076,439	14.3	15.3
1925	3,518,728	3,110,192	408,536	11.6	23,223,185	6.6	7.5
1926	3,965,477	3,172,378	793,099	20.0	39,218,064	9.9	12.4
1927	4,299,889	2,468,806	1,831,083	42.6	11,563,452	2.7	4.7
1928	4,203,688	2,843,995	1,359,693	32.3	51,028,557	12.1	17.9
1929	4,235,762	4,110,455	125,307	3.0	60,198,119	14.2	14.6
1930	4,895,411	4,586,029	309,382	6.3	57,782,857	11.8	12.6
1931	5,439,633	5,275,082	164,551	3.0	95,204,356	17.5	18.1
1932	4,386,334	2,894,616	1,491,718	34.0	27,631,878	6.3	9.6
1933	4,444,966	973,875	3,471,091	78.1	7,238,114	1.6	7.4
1934	4,780,959	2,565,003	2,215,956	46.3	12,473,906	2.6	4.9
1935	4,508,828	892,322	3,616,506	80.2	3,778,615	.8	4.2
1936	4,804,051	3,105,775	1,698,276	35.4	21,136,756	4.4	6.8
1937	6,612,715	3,238,070	3,374,645	51.0	15,385,740	2.3	4.8
1938	5,595,880	4,001,590	1,594,290	28.5	37,671,120	6.7	9.4
Average	3,641,619	2,413,138	1,228,481	33.7	28,739,512	7.9	11.9

Source: Biennial Reports, Kansas State Board of Agriculture. The counties included are Norton, Graham, Trego, Ness, Hodgeman, Ford, Clark, and all counties west of these.

Table 6.- Wheat: Acreage harvested and production, United States, high-risk area, and all other United States areas, 1919-38

Year	United States 1/			High-risk area 2/			Other United States areas 3/		
	Acreage harvested	Production	Yield per harvested acre	Acreage harvested	Production	Yield per harvested acre	Acreage harvested	Production	Yield per harvested acre
	1,000 acres	1,000 bushels	Bushels	1,000 acres	1,000 bushels	Bushels	1,000 acres	1,000 bushels	Bushels
1919	73,700	952,097	12.9	6,250	64,925	10.4	67,450	887,172	13.2
1920	62,358	843,277	13.5	7,254	106,836	14.7	55,104	736,441	13.4
1921	64,566	818,964	12.7	8,448	84,129	10.0	56,118	734,835	13.1
1922	61,397	846,649	13.8	8,333	103,423	12.4	53,064	743,226	14.0
1923	56,920	759,482	13.3	6,708	60,644	9.0	50,212	698,838	13.9
1924	52,463	841,617	16.0	7,661	106,529	13.9	44,802	735,088	16.4
1925	52,443	668,700	12.8	8,076	85,007	10.5	44,367	583,693	13.2
1926	56,616	832,213	14.7	9,072	106,620	11.8	47,544	725,593	15.3
1927	59,628	875,059	14.7	9,207	118,982	12.9	50,421	756,077	15.0
1928	59,226	914,373	15.4	10,545	154,801	14.7	48,681	759,572	15.6
1929	63,332	823,217	13.0	12,197	143,690	11.8	51,135	679,527	13.3
1930	62,614	886,470	14.2	12,935	146,978	11.4	49,679	739,492	14.9
1931	57,681	941,674	16.3	12,284	157,129	12.8	45,397	784,545	17.3
1932	57,839	756,927	13.1	10,176	106,202	10.4	47,663	650,725	13.7
1933	49,438	551,683	11.2	6,238	37,043	5.9	43,200	514,640	11.9
1934	43,400	526,393	12.1	5,811	31,781	5.5	37,589	494,612	13.2
1935	51,229	626,344	12.2	6,830	46,807	6.9	44,399	579,537	13.1
1936	48,863	626,766	12.8	6,437	37,192	5.8	42,426	589,574	13.9
1937	64,422	875,676	13.6	7,567	50,222	6.6	56,855	825,454	14.5
1938	69,869	931,702	13.3	9,729	95,810	9.8	60,140	835,892	13.9
Average	58,400	794,964	13.6	8,588	92,237	10.7	49,812	702,727	14.1

1/ Compiled from the 1936 and 1939 volumes of "Agricultural Statistics."
2/ Compiled from county data furnished the authors by State Agricultural Statisticians. As county data for New Mexico and Wyoming were not available, wheat production for the entire States are included, but only a small proportion is grown outside the high-risk area in either case.
3/ United States acreage and production minus high-risk area acreage and production.

Table 7.- Wheat: United States carry-over 1/, United States production, and high-risk area production, 1919-38

Year	United States carry-over	United States production	High-risk area production
	1,000 bushels	1,000 bushels	1,000 bushels
1919	144,885	952,097	64,925
1920	126,796	843,277	106,836
1921	114,317	818,964	84,129
1922	136,959	846,649	103,423
1923	137,087	759,482	60,644
1924	108,401	841,617	106,529
1925	100,225	668,700	85,007
1926	109,506	832,213	106,620
1927	112,372	875,059	118,982
1928	228,373	914,373	154,801
1929	288,879	823,217	143,690
1930	313,288	886,470	146,978
1931	375,473	941,674	157,129
1932	377,939	756,927	106,202
1933	274,306	551,683	37,043
1934	146,708	526,393	31,781
1935	141,688	626,344	46,807
1936	102,477	626,766	37,192
1937	172,280	875,676	50,222
1938	293,366	931,702	95,810
Total	3,805,325	15,899,283	1,844,750

1/ Carry-over as of June 30 of following year.

Source: United States carry-over and production are from "Agricultural Statistics." High-risk area production was compiled from county data from the State Agricultural Statisticians.

Table 8.- Wheat: Acreage harvested and production for the United States, the Great Plains States 1/, and the high-risk area 2/, specified years 1899-1938

Item	Unit	1899	1909	1919	1924	1929	1934	1938
Wheat acreage harvested								
United States	1000 acres	52,589	44,263	73,099	50,862	62,000	41,943	69,869
Great Plains States	do.	17,778	22,212	39,011	32,985	43,452	23,239	46,529
Percentage of U. S. acreage	Percent	34	50	53	65	70	55	67
High-risk area	1000 acres	794	2,147	6,250	7,661	12,197	5,811	9,729
Percentage of U. S. acreage	Percent	1	5	9	15	20	14	14
Production, all wheat								
United States	1000 bu.	658,534	683,379	945,403	800,877	800,649	513,213	931,702
Great Plains States	do.	206,515	320,388	431,079	502,688	493,852	212,361	505,205
Percentage of U. S. production	Percent	31	47	46	63	62	41	54
High-risk area	1000 bu.	7,719	26,098	64,925	106,529	143,690	31,781	95,810
Percentage of U. S. production	Percent	1	4	7	13	18	6	10

1/ Montana, Wyoming, North Dakota, South Dakota, Nebraska, Colorado, Kansas, New Mexico, Oklahoma, and Texas.
2/ Includes State totals for New Mexico and Wyoming.

Data from 1899 to 1934, inclusive, are from the United States Census of Agriculture. Data for 1938 are from U.S.D.A. Crops and Markets, Dec. 1939.

Table 9.- Indices of wheat production, United States, high-risk area, and other areas, 1919-38 1/

Year	United States	High-risk area	Other areas
1919	120	70	126
1920	106	116	105
1921	103	91	105
1922	106	112	106
1923	95	66	99
1924	106	115	105
1925	84	92	83
1926	105	116	103
1927	110	129	108
1928	115	168	108
1929	104	156	97
1930	112	159	105
1931	118	170	112
1932	95	115	93
1933	69	40	73
1934	66	34	70
1935	79	51	82
1936	79	40	84
1937	110	54	117
1938	117	104	119

1/ Bases - Average yearly production, 1919-38 = 100.
United States production 794,964,000 bushels
High-risk area 92,237,000 bushels
Other areas 702,727,000 bushels

Source: Computed from data in table 6.

Table 10.- United States wheat imports including flour, 1919-38

Year beginning July	Total imports	Percentage of production
	1,000 bushels	Percent
1919	216,671	22.8
1920	312,625	37.1
1921	265,590	32.4
1922	205,079	24.2
1923	131,392	17.4
1924	254,695	30.3
1925	92,669	13.8
1926	205,994	24.8
1927	190,578	21.8
1928	142,301	15.6
1929	140,361	17.0
1930	112,435	12.7
1931	123,774	13.1
1932	32,284	4.3
1933	25,508	4.6
1934	1/ 3,602	-
1935	1/ 30,709	-
1936	1/ 26,340	-
1937	103,633	11.8
1938	106,161	11.4

1/ Net imports; that is, imports for consumption minus domestic exports.

Source: "Agricultural Statistics."

Table 11.- United States wheat exports, by classes, 1924-38 1/

Year beginning July 1	Hard red spring	Hard red winter	Soft red winter	Durum	White	Flour in terms of wheat	Total
	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels
1924	21,567	120,575	8,333	33,816	11,201	65,313	260,803
1925	4,958	9,677	2,563	26,834	19,157	44,846	108,035
1926	2,174	73,123	31,352	21,970	27,631	62,910	219,160
1927	6,000	60,299	12,800	36,500	30,400	60,260	206,259
1928	2,200	35,014	3,000	47,500	15,400	60,573	163,687
1929	1,900	54,375	2,700	14,800	18,400	61,070	153,245
1930	600	47,365	2,600	12,100	13,700	55,110	131,475
1931	100	75,521	2,200	4,700	14,000	39,276	135,797
1932	2/	16,987	2/	1,700	2,200	20,324	41,211
1933	2/	1,400	2/	2/	17,399	18,202	37,002
1934	2/	170	10	2/	2,839	18,513	21,532
1935	2/	108	37	2/	166	15,618	15,929
1936	2/	424	49	2/	2,695	18,416	21,584
1937	2,000	62,540	4,000	2/	15,200	23,454	107,194
1938	3,000	58,200	2,200	2,000	19,189	31,195	115,784

1/ Includes exports of flour made from domestic wheat, and foreign wheat milled in bond.
2/ Less than 500 bushels.

Source: "Agricultural Statistics."